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SUPERGRAVITY WAS DISCOVERED BY D.V. VOLKOV AND V.A. SOROKA IN 1973¹⁴⁴

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6 **Abstract:** Supergravity is a remarkable theory combining supersymmetry and
7 general relativity. While the theory has a number of creators from across the
8 globe, we wish to address the question of the origins of this fantastic idea and
9 relevant chronology.

10 The idea of supergravity — SUGRA in short — (without mentioning
11 this name per se) was first formulated on December 5, 1972, in the last
12 paragraph of the paper by Prof. Dmitry V. Volkov (47 years old at that
13 time), and his PhD student Vladimir P. Akulov (28 years old at that time)
14 entitled *Possible universal neutrino interaction* [1] followed by the paper *“Is
15 the neutrino a Goldstone particle?”* received by the PLB office on March 5,
16 1973 [2]. I quote verbatim

17 ...[T]he gravitational interaction may be included by means of
18 introduction the gauge fields for the Poincaré group. [...] if the
19 gauge field for the transformation (3) is also introduced; then, as
20 a result of the Higgs effect the massive gauge field with spin 3/2
21 appears — the Goldstone spin- $\frac{1}{2}$ particle combines with it and dis-
22 appears.

23 The outlined program was materialized in a concrete model in 1973 by
24 Volkov and his PhD student Vyacheslav A. Soroka (29 years old at that
25 time) and reported in the paper *“Higgs effect for Goldstone particles with
26 spin 1/2”* [3] (Received by the JETP Lett. Editorial Office on October 20,
27 1973.)

28 The above date can be viewed as a day of the discovery of nonlinearly
29 realized supergravity in a physical model. Unfortunately, this publication
30 went largely unknown to young researchers on the other side of the Iron
31 Curtain.

¹⁴⁴East Eur. J. Phys. 3. 81–82 (2019), with abbreviations.

1 The development and thorough studies of SUGRA in the West — at first,
 2 pure gravity without matter, with the subsequent inclusion of matter —
 3 were carried out three years later in 1976. Only then a new “magic” word
 4 “supergravity” which was absent in the Volkov-Soroka paper was coined
 5 [4, 5]. The Freedman-van Nieuwenhuizen-Ferrara (FNF) paper [4] was titled
 6 “*Progress toward a theory of supergravity*” [4] and it cites the Volkov-Soroka
 7 article [3].

8 In the same month (June, 1976), the Deser-Zumino (DS) paper “*Consis-*
 9 *istent supergravity*” was published [5], which cited the FNF preprint and also
 10 Akulov, Volkov, and Soroka’s paper of 1975 “*Gauge fields on Superspaces*
 11 *with Different Holonomy Groups*” [6].

12 The history of supergravity is given in the *SUSY story* (narrated by its
 13 founders) ([7], pp. 1–28) and in the article *Supergravity* [8]. The connection
 14 between the Volkov-Soroka and FNF approaches was explained in a clear-
 15 cut manner several times, e.g. (i) by D.V. Volkov in [9, 10] and (ii) by V.A.
 16 Soroka in *The Sources of Supergravity* [11, 12] or in *The Starting point of*
 17 *supergravity*, [13].

18 I feel sorry that in most of the mass media articles about prizes given for
 19 the “discovery of supergravit” no mention is made of the 1973 discoverers of
 20 supergravity, Dmitriy Vasilievich Volkov and Vyacheslav Soroka. I refer the
 21 reader to their Memorial Page [14].

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